PROGRESS
OF
MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF
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1. **Double Heart Rate, with Remarks on the Analysis of Irregular Pulses.**—HOFFMANN (*Zeitschrift f. klin Med.*, 1904, Bd. liii. p. 206). 2. **The Paroxysmal Occurrence of Doubled Heart Rate.**—LOMMEL (*Deutsch. Arch. f. klin. Med.*, 1905, Bd. lxxxii. p. 495). 3. **Contribution to the Study of the Extrasystoles.**—GERHARDT (*Ibid.*, p. 509).—These three contributions present the most recent views on paroxysmal tachycardia. Hoffmann was able to obtain numerous pulse tracings at the beginning and termination of attacks, and makes the following interesting observation: With a pulse of a normal period of $\frac{4.6}{5}$ second, suddenly occurs a diminution to $\frac{2.3}{5}$ second, with each second beat much smaller in size than the preceding; after about seven such beats a still smaller one begins to be interpolated just in the middle of each beat, and this rapidly growing in size, the waves soon recur at regular intervals of $\frac{1.15}{5}$ second. These waves, it is true, are not all of one height, but the variations have no regular recurrence and the interpolated waves become indistinguishable from the original $\frac{4.6}{5}$ elevations. In other words, a pulse of 60 per minute rises suddenly to 120 and then rapidly to 240, so that the first rise is just twice and the second four times as rapid as the original normal pulse. The termination of an attack does not, as a rule, occur with such precision; the pulse becomes irregular and long and short periods vary for about three beats until the rate drops to normal. Even this irregularity, however, is remarkable, as the length of each individual beat represents a multiple of the length of the foregoing rapid beats. The venous pulse, too, during this decline is of great interest, as it shows distinctly that the auricle beats at the increased rate longer than the ventricle. Hoffmann goes over the literature carefully and selects many cases which he is sure must, if carefully observed, have shown the same condition as his own.

Such a proportionate increase and decrease in the rate of contraction of the cardiac muscle is not without analogy in physiological experiments. Kries has shown that by warming and cooling different parts of the heart the rate of contraction of the warmed part is always a multiple of 2 of the rate of the cooled part. Thus it may be 2, 4, 8, 16 times as rapid, but never 3, 5, or 7, etc. Gradual changes in the temperature were always associated with sudden changes in the rate, N beats going at once to N 2 beats and then to N 4 beats, etc. Engelman, also, has noticed in pieces of resected vein from the frog's heart that sudden single stimuli thrown in at the end of diastole will cause the muscle to make a number (from 2 or 3 to over 50) of rapidly succeeding contractions, the new rate being just double the original, while the return to the original rate is abrupt, not gradual, as in stimulation of the accelerator nerves. The origin of the cardiac impulse has been definitely placed in the vena cava, and it may be assumed that there is formed here a continuous and constant stimulation always ready to act but able to manifest itself only periodically on account of the refractory period of the muscular contraction, or that the stimulating substance is itself used up in discharging an impulse and must reaccumulate before being able to start a new contraction. As evidence favors the second view, changes in contraction rate should then depend upon positive or negative chronotropic[1] influences. The theory of a constant stimulus would involve the assumption of the existence of negative or positive changes in irritability. Either of these views explains satisfactorily enough the usual variations in heart rate, but there would appear to be no reason why they should act so as to cause abruptly a halving or doubling of the previous frequency. Analogy with physiological experiments suggests at once that there must be some change in irritability, while the stimulating centre continues to work rhythmically. To explain this consistently, Hoffmann suggests that higher up in the vein than where the normal impulse takes its start there may be muscle fibres in which is generated a rhythm faster than the normal heart rate. If these, for instance, develop 4-N impulses, and, as in Kries' experiment, the neighboring fibres are able to respond to only every second, these will take up a 2-N rhythm, and the point where the normal cardiac contraction has its origin, able to answer only every other impulse, will take up a 1-N rhythm. If, then, the conductibility, irritability, and contractibility of the heart and of the fibres at this point be increased, it may come to pass that instead of every other impulse, each individual impulse from the point above may take effect, resulting in a doubling of the heart's rate. Similar conditions occurring higher up would then allow a quadruple heart action. For the origin of such influences Hoffmann looks to the nervous system.

Lommel cites a case which corroborates Hoffmann's observations, and accepts his deductions almost completely. He lays special emphasis on the pulsus alternans character of the curves at the beginning and end of an attack. Hoffmann in 1900 had suggested the view that attacks of paroxysmal tachycardia depended upon a heaping of extrasystoles, the continuous irritation giving rise to premature systoles as soon as the bounds of the refractory period were reached. The perfectly regular rhythmical recurrence of the pulse waves, the absence of any compensatory pause over a long period of time, and the curious proportion of increase in rate lead both Hoffmann and Lommel to discard this view. Gerhardt, however, has something to say in its favor. His curves and interpretations cannot be reproduced, but he believes he has shown that a doubling of the pulse rate, as well as a gradual increase in the size of the interpolated wave (as in Hoffmann's curves at the onset of an attack), may be produced by extrasystoles. He lays emphasis upon the tendency to the production of extrasystoles just before and after an attack of paroxysmal tachycardia.

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[1] Influences involving the development of the stimulus.

SURGERY.

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Scopolamine-morphine as an Adjuvant in the Administration of General Anæsthesia.—SEELIG (*Annals of Surgery*, August, 1905) presents a series of 65 general anæsthesia administrations by this method to show that it merits recommendation and trial. The operations invaded the abdomen, cranium, neck, and rectum. In every instance the patient received a hypodermic injection of scopolamine hydrobromate gr. $\frac{1}{100}$, of morphine gr. $\frac{1}{6}$, one-half hour before the administration of the general anæsthetic, which was induced by the ethyl chloride-ether sequence. The Bennet inhaler, with a slight modification for the administration of the ethyl chloride, was employed for the general anæsthesia.

Scopolamine is an alkaloid from the hyoscyamus niger. Its sister alkaloids are hyoscine, daturine, duboisine, atropine, and hyoscyamine. By some authorities it is claimed that scopolamine is closely allied to hyoscine; by others that the two are identical, while Ladenburg claims that hyoscine and scopolamine are by no means identical.

Kochman states that there has never been a death from scopolamine. By the method of administration and dosage worked out by Korff, three doses are given, at three, one, and one-half hours before operation. Rational objections have been made to the fixed dosage. Three deaths have occurred.

Seelig is enthusiastic in its praise. Of his 65 cases, only 1 vomited or retched while on the operating table; 77 per cent. did not vomit at all. One-third of the cases that did vomit, vomited only once, and then only from 2 drachms to 1 ounce of clear mucus. Nausea was never pronounced, except in 2 cases, and vomiting never occurred earlier than two hours after the operation. Laryngeal sensibility was intact by that time and acted as a complete safeguard against tracheal inspiration, and the consequent danger of aspiration pneumonia. Besides decreasing the tendency to vomit, it lessened the quantity of the anæsthetic necessary, only 4 ounces per hour at operation being required.